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Information Technology and Product Policy (B): Information Products

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Abstract

Information products are crafted from data, a totally different kind of raw material, and they can be delivered in a range of media, physical as well as nonphysical, and permanent as well as transient. These characteristics make for a special relationship between data, information products, and information technology (IT), especially when the technology is employed to digitize the data and, much like a potter's wheel, shape the pliable clay of (possibly multimedia) 1s and 0s into an assortment of analog and digital products. Increasingly, consumers, too, have access to their own potter's wheel of IT—to add value of their own and fashion derivative products. IT's role does not end there: the technology can also serve as the pot, the medium in which the clay is transported and displayed, albeit it as a transient electronic flicker; and as the conduit for an expanded product scope that includes "analysis" and "transactions." This article details why data, information products, and IT are a special triad; next, it articulates the important product-policy concerns; and, having framed the issues, it considers IT's impact on product policy in three cases: (1) digital database, analog product, physical medium; (2) digital database, digital product, physical medium; and (3) digital database, analog or digital product, electronic medium. The exploration is, admittedly, only a rough sketch of a topographically rich territory; but we are in the early days of exploration, and even a rough sketch can be of great assistance given the paradigm shifts in play.

Mention "information technology," and many managers will think of computers—as nerve centers for an organization's information, control, decision-support, and communications systems; as enablers of task automation; as foci of new product-design and manufacturing technologies; as coordinators of material flows and logistical support; and so on. While these information-technology (IT) applications can—and do—affect a firm's products, the impact usually is indirect.[1]

This is the second of two articles focusing on IT applications that have a direct impact on products and product lines. In the first article in the series (Dhebar, 1995c), I took up the case of "smart" products—physical products that have IT embedded in them; in this article, I look at information products, the "production" (information collection, storage, editing, and publishing), distribution, access, and consumption of which are increasingly dependent on IT.

Information Products: A Special Product Category

Information products stand apart from other products—a scoop of ice cream, a haircut, a ream of office-copier paper, a janitorial service, a personal computer, a country-club membership, a luxury sedan, a factory-construction contract, and so on—in two very important ways: (1) their building blocks are data, a totally different kind of raw material; and (2) they can be delivered in a range of media, physical as well as nonphysical, and permanent as well as transient. These distinguishing characteristics make for a special, multi-faceted relationship between information products and information technology and lie at the root of some rather unique product-policy concerns.

Begin with data, the raw materials, the "clay" from which the many information products of industries such as publishing, education, entertainment, financial services, broadcasting, and telecommunications are fashioned. As raw materials go, data are quite unusual:

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[1] The impact, though indirect, may still be significant. Better and more timely information, improved decision support, design automation, flexible manufacturing, electronic data interchange, and so on, can have a significant impact on the product line. I focus on direct IT effects in this article not on the basis of their significance or otherwise but because of the product-policy issues that are raised.

- They may be obtained from a number of diffused sources, they may be abstract in nature, and, in and of themselves, they need not be represented in a specific physical form.[2]
- Often, data can be repeatedly copied without depleting or diminishing the original and, properly archived, will not deteriorate over time.[3]
- Even when data are represented in an analog form and stored in or on a physical medium, they can be sliced and spliced with relative ease in many different ways and packaged and repackaged at will. The data's shaping into finished products, while bound by traditional rules of "grammar" and constrained by technology, is remarkably free of the constraints encountered in the case of other, non-information, products.
- Not only do data lead to information, the information itself may become data for yet additional information, and details about the conversion of the data into information may, in turn, form the basis for even more information—information that may be marketed as product, though not necessarily to the same customer population.

Once data are collected, "sanitized" (checked for relevance and accuracy, noise eliminated, information content amplified, and so on), and stored, they can be rendered into and marketed as a variety of products through the editorial, publishing, and distribution process, with a wide range of

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[2] Consider, for example, the sentence in which this point is made. It consists of words (consisting, in turn, of letters of the alphabet), but the information contained in it ("data may come from a number of diffused sources," "data can be somewhat abstract in nature," and "in and of themselves, data are not necessarily tied to a specific physical form") synthesizes several elements, and the synthesis transcends the specific words and alphabet letters. Furthermore, the sentence first took shape in my mind (in what form?); then, it appeared as multicolored "pixels" on my computer screen; later, I saved it on a disk as an electronic file; next, I used a laser printer to print it on paper in black-and-white and using Palatino font; and some readers will "see" it, others will "read" it, while others may "hear" it.

[3] The media in which the data are stored might deteriorate and, as a consequence, some or all data may be lost or may deteriorate in quality, but that is not the same thing as the data themselves deteriorating. This comment does not imply that the information value of the data may not deteriorate; indeed, some data, for example, today's weather forecast, are perishable in that their value and relevance diminish once their time has passed.

possible user-level interactivity. Information products stand out in these regards as well, particularly when IT is employed facilitate some or all of these tasks. Staying with the data-is-like-clay metaphor, IT's role falls into two categories: the "potter's wheel" that is used to shape the clay, and the "pot" that is the medium in which the clay passes from the potter's wheel to the end user.

The Two Roles of IT

The Potter's Wheel

While planning this article, I happened to talk to a friend working on a CD-ROM-based kitchen-design planning tool that used as a starting point a book which, in turn, was a print-on-paper compendium to the popular television program "This Old House." The core product in all three cases was information—information on the same topic (in the case of my friend's project, kitchen design) and launched off the same primary source, but with significant differences in content, format, product-user interaction, delivery media, copyright considerations, and so on. An important reason for the differences: the CD-ROM version employed the potter's wheel of IT to digitize the data and to fashion the digital brew into a very different kind of product. And what an unusual potter's wheel IT is when operating on data:

- Through the process of digitization, it converts data from analog clumps of, for example, text-charts-pictures-and-doodles-on-paper, sounds-on-tape, and images-on-film into elemental strings of 1s and 0s.[4] In this regard—the ability to represent all information with the help of just two building elements—IT is fundamentally different from other potter's wheels as the pencil, the typewriter, the typesetting press, the tape recorder, and the film editor.

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[4] Characterizing the bits of 1s and 0s as "the DNA of information," Negroponte (1995) explores this conversion at some length. Purists would argue—correctly—that some information is lost in the translation from the analog form in which many data originate and the digital form in which they are stored in the IT medium. The loss is diminishing given improvements in sampling and data-compression technologies and falling prices and greater availability of more capacious memory devices.

- A central difference between IT and the more traditional data processors such as the pencil, the typewriter, the typesetting press, the tape recorder, and the film editor is in the product possibilities: data structures consisting of 1s and 0s are profoundly more pliable than databases consisting of analog text, numerical data, graphical images, still pictures, sounds, and video footage, and the result is a larger and deeper product-possibilities set. Consider: at a very basic level, it is difficult to meld together a paragraph of text with a chart with a video clipping with sound; you can create a multimedia collage, but the respective data clumps maintain their individual media identities. With all data represented in the form of 1s and 0s, the granularity is much finer. Negroponte (1995) characterizes the mixing of 1s and 0s from different media as "commingling." Commingling is the special opportunity of multimedia.
- The potter's wheel of IT and the opportunity to commingle bits not only transform the product-possibilities set, they also radically alter the economics of product creation—and thus further transform the product possibilities. By way of example, compare at the level of product, product-line possibilities, production cost, print-run length, and revision dates the book version of "This Old House" with the CD-ROM my friend was producing. What are the consequences for product policy?
- Then, there is the matter of keeping track of value—of the data when they are collected, of the different 1s and 0s once data are digitized (all data, information-rich or information-poor, are represented in the form of 1s and 0s but, value-wise, all 1s and 0s are not the same), and of the commingled 1s and 0s once they are offered as information products to individual consumers.
- In theory at least, the potter's wheel of IT can extend seamlessly from the information-product producer to the end user, with each link in the distribution chain performing value-added operations on the same 1s and 0s, raising thorny questions about product integrity, boundaries, ownership, and so on. Furthermore,

with bits replacing atoms and on-line information services coming into their own, the distribution-chain construct itself may need to be revisited.

- The product does not have to be limited to "information." Appropriate extensions can be made to include user-level analysis and transactions. In the case of my friend's CD-ROM, for example, the consumer will be able to plan alternative kitchen layouts, see them in isometric rendition, and virtually experience the texture of countertop surfaces. While it was not the case in my friend's product, the CD-ROM could also have been designed so that, having made the choice, the user can dial in via a modem and place an order for the necessary materials, sign a contract with a building contractor, and make payments with the help of "cybercash."

... and The Pot

Information products do not have to be represented in or on a "permanent," physical medium (for example, as text printed on paper, sound recorded on tape, or images captured on film). Instead, data can be compiled, transported, and, as a product, articulated as (transient) electronic signals that, with the help of IT, are heard as sound over speakers and/or seen on a video display. In such cases, IT provides the medium in which melded and shaped data are represented as information. The (not exact) metaphor is that of the pot.[5]

An example will help illustrate this IT-is-the-medium role. In 1973—well before the personal-computer revolution brought IT's potter's wheel to the individual consumer—Reuters Holdings PLC, a London-based news and information organization, started a Reuters Monitor Money Rates Service to disseminate foreign-exchange and money rates electronically to subscribers worldwide on low-intelligence display terminals ("dumb" terminals with no local computational capability and little

[5] The metaphor is not exact because the real, earthenware pot, a physical entity, is made of clay; in contrast, the IT-based pot employs the electronic medium to articulate data—which, as we saw earlier, do not need to be represented physically.

local memory).[6] Reuters distributed the information as "pages," which is also how the information was displayed and updated at each subscriber's terminal. The pages were pre-composed and the subscriber could not electronically slice and splice them at will. Reuters' production and distribution system employed IT in its first role (the potter's wheel) for data collection, editing, storage, and information composition; communications technology for the distribution of information to subscriber terminals; and IT in its second role (the pot) at the subscriber end for display.

The Reuter Monitor Money Rates Service pages were transported and accessed as complete pages. In that sense, they were analog—and not digital—information products. That is one of the interesting features of IT in its role as the pot: it can be used to transport and provide a user-level access medium for analog as well as digital representations of information products.

Information Products and IT: Product-policy Questions

As the potter's wheel or as the pot, the use of IT in the production, distribution, access, and consumption of information products raises a number of product-policy questions:

(1) A lot of data start off—and will continue to start off—in analog form (live sound and video footage are two examples). When, if at all, should the data be digitized and how far down the distribution chain should they be kept in digital form? Also, at what stage in the chain should the data be converted into information?

(2) What about data collected and transformed into information before digitization was technologically possible and economically practical? There are (literally) volumes of such data around. Should these data be digitized to render "new-and-improved" products?

(3) At what stage, if at all, along the product-distribution chain should information bits be packaged into (or on to) physical media?

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[6] See Dhebar (1995a) for a description of the dynamic interplay between Reuters' technological choices, the company's products and markets, and the evolution of demand for financial information.

(4) Even if the data and/or the information product are not digitized, to what extent should IT be used as a transport and display medium for pre-composed information?

(5) To the extent that (1) through (4) result in a change in the user interface, what should the new interface be? How would the user navigate through the data/information?

(6) How much user interactivity should be built into the product, and should the interactivity be local (for example, the ability to analyze data or perform simulations) and/or with the product supplier (to query a database or to place an order) and/or with other product users (to enact a transaction or to play a game)?

(7) In the case of multimedia products, how integrative a (digital) database should the supplier establish and how much commingling should there be? The answer may require the supplier to revisit some or all of the above questions.

The above questions are very real and very current for product managers in the publishing, education, entertainment, financial services, broadcasting, and telecommunications industries as they redefine existing products and launch new ones in the wake of the "information superhighway," the increased capability and accelerated penetration of multimedia hardware, and the yet-to-be-seen-in-what-form convergence of the telephone, the television set, and the computer—all the while separating hype (and there is a lot of hype) from reality and making sure specific answers are chosen because they make sense and not because they are the fashion of the times.

While the above questions are of great contemporary import—and articulating them has intrinsic value in and of itself—the problem is, it is difficult to answer them at the level at which they are posed. The principal reason for this is that truly useful answers are, with some exceptions, highly context-specific: the answers are likely to be quite different for, say, Penguin books, Disney films, Sega video games, Time-Warner cable, Citicorp banking services, MCI on-line services, and distant-learning programs, to name but a few. Accordingly—and to add value to the reader at the broader, conceptual level—I will frame the issues somewhat differently.

Specifically, I will examine some of the more important product-policy issues in the following generic cases: (1) digital database, analog product, physical medium (example: this article); (2) digital database, digital product, physical medium (example: a demographic database available on a CD-ROM); and (3) digital database, analog or digital product, electronic medium (example: the Reuters Monitor Money Rates Service and its digital descendants). The first case focuses on IT-as-the-potter's-wheel at the producer end, the second case extends the potter's wheel down to the consumer, and the third case takes up the case of IT-as-the-pot, with or without the potter's wheel aspect. This classification scheme will allow us to get to some of the more interesting product-policy issues without getting mired in the finer details.

Digital Database, Analog Product, Physical Medium

Traditionally, information products have been created, distributed, and used in analog form, physically, and without much commingling.[7] A printed all-text newsletter, a table of equity prices on a stock exchange display board, and a pre-recorded audio cassette are good examples. An obvious starting point for the use of IT in this setting is at the producer end. Indeed, today, most information producers have at least the vestiges of an IT architecture, if not as one seamless interconnected data storage, editorial, and publishing system, then in the form of individual workstations.

The investment in digitization can bear fruit—even without any apparent change in the final product. Thus, the distribution system may continue to distribute and the consumer may continue to receive the "same" analog product in the physical medium, but with improvements in data accuracy, system productivity, publishing economy, and product flexibility at the information-producer end:

- By working with a digital database rather than an analog one, the producer can, at the very least, reduce the time, money, and hassle—not to mention the possibility of

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[7] It is useful to distinguish coexisting media from commingled multimedia: books have text, graphs, and sketches and movies have synchronized video and audio tracks (coexisting media), but that is not quite the same thing as a hypertext-linked multimedia CD-ROM where the user can construct multitudinous information sets by stringing together digitized audio, video, text, numeric, and pictorial data.

errors—that go into transcribing analog data from one location, format, or medium to another, converting the data into information, and publishing and distributing the information as a product in an appropriate physical medium.

- In a competitive environment, these benefits should lead to a cleaner, crisper, cheaper, more-customized product that gets faster to the end user. Indeed, the information producer should be able to more speedily and economically introduce a greater variety of products in the information marketplace.[8]

It behooves the information-product manager—and not the chief information officer or whoever is in charge of information systems—not to take the above benefits for granted. Information-product managers would do well to bear in mind the following considerations as they go about digitizing databases and turning to the potter's wheel of IT for converting digital data into information products:[9]

- IT is beguiling when it comes to a balance between form and content: it is easy to get sucked into the game of getting the appearance "right"—so much so that parts of the editorial and publishing system lose sight of the fact that content, too, matters. It does not do much good, for example, if a piece of text looks attractive if the writing is of poor quality.

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[8] I began this article by making a distinction between IT's direct and indirect impacts on products and product lines and stating that the article would focus on direct impacts. If the final information product looks and feels the same pre- and post- IT, then the reader may well ask, "Isn't this an indirect impact? Aren't such IT applications to information products what flexible manufacturing systems are to physical products?: Both reduce set-up costs and bring the efficiency, economics, and quality discipline of mass manufacturing to small production batches—and both only indirectly affect product policy." The point is well taken, but the comparison between flexible manufacturing systems and computerized data collection and storage, content editing and composition, and information-publishing systems is not quite valid: the former do not interact with the raw materials of the physical products that they are used to manufacture in the same way as the latter do. It is the basic interaction between the clay (data and information) and the potter's wheel (IT) that makes the impact of IT on product policy direct rather than indirect—and a reason for managing the IT initiative with a different sensitivity than a flexible manufacturing systems initiative.

[9] These considerations are the information-product equivalents of IT-related product-policy challenges identified in Dhebar (1995c) in the case of "smart" products—physical products that have IT embedded in them.

- Product customization is a worthy goal, but there is such a thing as excessive product variety. Just because data digitization and editorial-and-publishing-system automation reduce setup costs and transform the economics of product variety, it does not mean that the product manager must increase the extent of variety. In the final analysis, the distribution system should be able to handle the variety and consumers should value it.
- Data digitization and editorial-and-publishing system automation enable the product manager to introduce new products more rapidly in the marketplace. That is an advantage. But there is also a risk: digitization and automation relax or eliminate some of the old-style supply-side constraints, and the less-restrained supply side may introduce new and new-and-improved products faster than the distribution system or the consumers can avail themselves of the new versions.[10]

The above benefits and risks are only the first-order effects of data digitization and the application of IT as the potter's wheel at the information-producer end. Once the benefits have been realized and the pitfalls avoided, the real action can begin: the consolidation of multifarious digital data bits into one large integrated digital database (stored centrally or networked over several workstations), the feeding of these data through a computerized information "turbine," and the creation of new products by shaping the data in entirely new ways. Even though the new products may be analog, not multimedia, and rendered in a physical medium, the novelty with which the data contained in them are shaped may make them particularly attractive in the marketplace. It is in the consolidation of islands of data into some transcendental larger set and in the creative shaping of new information products from the data set that the real opportunity of IT lies.

And, by and large, that is what it remains, an opportunity: most information producers are nowhere near the ideal of one large integrated digital database, computerized information turbines

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[10] See Dhebar (1995b) for a more detailed discussion of situations where speeding producers of new-and-improved products may run into balking consumers.

are more (hyped up) goals than real systems, and creating non-traditional cross-data products requires traditional product managers to think outside the box.

Digital Database, Digital Product, Physical Medium[11]

A printed all-text newsletter, a table of equity prices on a stock exchange display board, and a pre-recorded audio cassette—in all these cases, the user receives information he or she may see, read, hear, record, clip, save, or whatever, and add value through understanding and comprehension. There is a fundamental limit on the type and amount of value the user can add, and how he or she can add it. Specifically, it is often difficult, if not outright impossible, to back out into the raw data the information provider began with and to add value differently; and even if the user is satisfied with value as added by the information provider, it is not always easy or convenient to take the printed newsletter, stock-quote display board, or pre-recorded cassette and physically mix them with other pieces of information to create new information.[12]

Some or many of these limitations can be overcome if the information product were delivered to the user in digital form, albeit in or on a physical medium. Thus, if the newsletter were available as an electronic file on a floppy disk (instead of printed text on paper), the table of equity prices were distributed on a CD-ROM (instead of a display board), and the pre-recorded audio segment were marketed in a computer-readable format, then the user can sit at his or her own potter's wheel of IT and perform all kinds of (hopefully) value added operations on the digitally represented information. The result: even though, at first blush, the consumer may be getting the same information (the same text, the same table of equity prices, and the same audio recording), the digital rendition is a very different product with a very different value proposition than the analog version. The principal

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[11] For a case study illustrating many of the issues raised in this section, see Dhebar (1992).

[12] Intellectual, or mental mixing, is of course possible, and we do it all the time. Indeed, you are reading this text and mixing it in your mind with other information already contained in your brain to arrive at a (hopefully) new level of understanding. But even the brain has its limits when it comes to information mixing.

reason for the difference: the user can add his or her (idiosyncratic) value, and thus fashion entirely new information sets—sets that the original information-product supplier marketing to a large population of consumers could not have conceived of or found it viable to implement.

Earlier, during the discussion of IT's role as the potter's wheel, I had alluded to my friend's CD-ROM-based kitchen-design planning too. The consumer can either read the section on kitchen design in the print-on-paper-book version of "This Old House," or they may play with the CD-ROM. In the CD-ROM rendition, consumers will be able to "try out" alternative kitchen layouts, "see" them in isometric form, and "experience" the texture of countertop surfaces. Clearly, even though the "information" contained in the book and the CD-ROM may seem the same, it is definitely not the same. We are looking at two very different products with very different value propositions.

The CD-ROM example points to another source of difference: the possibility of commingling, or multimedia. With text, graphics, still frames, motion video, and sound weaved together—and accessed by the user as such—the information conveyed to the user and the complete product-use experience are very different from the CD-ROM's book or television counterparts (the book allows greater user interactivity but offers very little in terms of multimedia; the television program offers a richer media mix, but—as of now—little interactivity). Appropriately designed and used, digital information products can allow the user to take maximum advantage of the information possibilities contained in the supplier's multimedia database, and this further sets apart the digital product from its analog predecessor, if any.

The transformation of the product and the value proposition (by going from an analog to a digital product) does not come without some challenges, however. These challenges bear explication, especially given the widespread excitement about information superhighways, multimedia computers, and CD-ROM-based "edutainment" (*infoedutainment* is probably a more appropriate descriptor) products. In this hype-charged environment, established publishers and information entrepreneurs alike are rushing digital versions of a plethora of heretofore analog products to market—not always without making sure that

(1) the analog products in question lend themselves to a digital rendition;

(2) from the consumer's point of view, there are significant value-added opportunities in obtaining the information in digital rather than analog form;[13]

(3) the information producer is able to shape the raw data in a form most conducive to consumers making the most of these value-added opportunities;

(4) given (1) through (3), consumers have the IT hardware and ancillary software tools to make the most of the value-added opportunities (consumers must have the right kind of potter's wheel and pottery-making tools);

(5) consumers know how to make the most of the value-added opportunities (consumers must know how to work with the data clay and how to make pottery out of it); and

(6) for all of these points to work out right, consumers must have a vision of the type of pot they would like to make—and the information-product producer must know what the vision of different consumer segments are (or might be).

As many information publishers are discovering—and as the uneven quality of commercially available multimedia software illustrates—getting all of the above six points right is no small feat. And for reasons somewhat deeper than those articulated in the points themselves.

For an appreciation of the somewhat deeper reasons, begin with the product. A comparison is often made between the multimedia software revolution and the Gütenberg press, but there is a basic difference: books existed before the Gütenberg press; there is no similarly close counterpart of a CD-ROM-based encyclopedia or art gallery. The difference gets to the heart of the problem: going from an analog to a digital product is not simply a matter of replacing analog representations with 1s and 0s. From the point of view of product consumption, everything is/can be different:

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[13] Limited for now to delivery in or on a physical medium. I take up the case of the electronic medium in the next section.

- product content (in terms of what the reader can do with it, this paragraph on paper, for example, is very different from an electronic file version of the "same" paragraph saved on a floppy disk),
- medium (paper *v.* floppy disk),
- value added and analysis possibilities (information supplier's end *v.* user's end),
- product-use infrastructural requirements (somewhere to sit and hold and read the paper *v.* a personal computer with a floppy-disk drive and operating-system and applications software),
- product-user interface (reading a paper held in a hand *v.* operating a keyboard and a mouse and reading from a computer screen), and
- product-consumption experience (reading and thinking *v.* reading and iterative thinking [mental] and [IT based] analysis).

Quite possibly, two very different product and product-user paradigms, with significant implications on the demand and the supply side.

From a product-policy perspective, the analog-to-digital product move will be of no avail if consumers cannot make something positive out of it, in particular, if they cannot—or choose not to—add value through heretofore-not-necessary analysis. That means adjusting to all the above dimensions of paradigm shift—not only for the consumers, but also for the information producer.

Which takes us to an interesting challenge for the producer: especially in the case of electronically delivered information products (we will consider them in detail in the next section), and even in the case of some physically delivered digital information products, there may be a downstream migration of value added, from the information producer (whose role may evolve into data provider) to the ultimate user, with significant implications for product commoditization and profit margins. Take the case of the table of equity prices. A more sophisticated information supplier may have computed some financial ratios, plotted some trends, and offered a more complete "stock analysis" newsletter service to its customers. With digitization, some consumers may say, "Don't

calculate the ratios and plot the trends. Just give us the raw data of equity prices, and we will do whatever analysis we want. And, incidentally, so-and-so is also willing to supply us the raw data at a much lower price than what you charge us for the stock-analysis newsletter."

What is the information producer to do? With the product in an analog form, the producer decided what value to add, kept the value addition proprietary, and charged the consumers for an essential service the producer provided: converting raw data into easily accessible and digestible information. With digitization, producer profits accruing as a result of the data-to-information conversion may diminish or disappear altogether as competition for providing information transforms into competition for peddling data.

There is at least one way to make up for this profit loss: to change the product line so the information-product supplier offers not only data and information, but also some of the tools that the consumers can use to analyze and add value to the digital data and information. But now we are talking about a fundamental organizational transformation. Take, for example, a newspaper publisher. The corresponding change there will be from publishing newspapers to selling raw journalistic data and selling story-editing newspaper-composition software that individual consumers can use to "publish" their own newspapers. Can the newspaper publisher, successful in that business, become an effective developer and marketer of story-editing newspaper-composition software? The two businesses require different skill sets—and product policies.[14]

No product-policy discussion of the digital information products can be complete without consideration of the installed-database issue. Many information producers and suppliers possess extensive archives of vintage data and, in many cases, complete analog products. Thus, there are dog-eared manuscripts and music scores, old editions of books and periodicals, vintage recordings

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[14] Reuters, the company talked about earlier in the Reuters Monitor Money Rates Service example, has experienced some of these transformations. In the wake of personal computers, intelligent workstations, and sophisticated financial technologies (options, futures, hedges, derivatives, and the like), Reuters' customers cared less and less about pre-composed information pages and more and more about raw, digital datafeeds. The latter are much more commodity-like products, with possibly much lower profit margins. In the late 1980s, Reuters started moving its products to the digital datafeeds model, but also started marketing analytical software.

and video footage, and so on and so forth. All analog, some out of print, and ripe for digitization and commercialization (in some cases, recommercialization). The relevant question in such cases is not "Can we do it?" (the answer is usually "Yes," though perhaps at a large cost), but "Does it make sense to do so?". For music-recording companies, the answer to the second question has clearly been a "Yes": vintage and classic recordings are being cleaned up, digitally remastered (sometimes with a creative mixing of today's talents with yesterday's sound), and marketed, often with great marketplace success. On the other hand, it is arguable whether it makes sense to take an old novel, digitize it, market the digital version on a floppy disk or a CD-ROM and hope that consumers will read it on a computer screen. The operative question, of course, is, does digitization (and all the paradigm shifts that go with it) add net value to consumers? A question that all information producers must answer before rushing to their database libraries and waving their digital wands.

When it comes to digitizing vintage and existing databases into "new-and-improved" digital products (really new and really improved?), there is also a philosophical question to bear in mind. Say the "Is there net value or benefit for the consumer?" question is answered in the affirmative—and say it is legal to do so (there may be thorny issues of copyright on some or all of the content). The question still remains, what are the implications for the integrity—and respect for—the original version? In other words, how, if at all, are, say, an author's or a painter's original design precepts mutated and violated if his or her book or painting is marketed on a CD-ROM? Does it matter that there is a mutation or violation of the original design precepts? Should the author's or painter's permission be sought? The probable answer—"If it is legal and if it makes business sense to do so we should go ahead"—begs the underlying philosophical questions.

Nonphysical (Electronic) Media

If digitization and multimedia are the trend in publishing, then on-line services, the Internet, and the World Wide Web are major business and cultural happenings, affecting not only the product policies of existing information-product suppliers, but also expanding the product mix of a much

wider range of businesses to include "information," and the product mixes of all to include "remote analysis," "communication," and "transactions." What we have in the on-line services-Internet-Worldwide Web phenomenon is an opportune marriage of information and telecommunications technologies to unleash an information revolution.[15] In this section, I shall try to conceptualize the major product-policy implications of this revolution.

To help structure the discussion, let us go back to the Reuters example. The Reuters Monitor Money Rates Service, introduced in 1973, was neither Reuters' first nor last financial-information product delivered over a information-plus-telecommunications technology network:[16]

- As early as October 1851, the company's founder, Paul Julius Reuter, used newly laid telegraph wires under the English Channel to supply customers in London and Paris with price information from major European stock exchanges.
- Later, in 1923, the company started using the new technology of radio to broadcast equity-price quotations and exchange rates several times a day. By 1938, Reuters was broadcasting commercial information to 26 destinations in Europe, the Middle and Far East, India, Africa, and South America.
- In the 1960s, the company entered the world of computers and, in 1970, introduced the Videomaster, a 72-digit screen display on which subscribers could select from over 9,5000 world stock and commodity prices that were collected by Reuters, fed into computerized databases, and distributed over voice-grade telephone lines.
- The Monitor Money Rates Service, with its electronically linked network of information contributors and recipients, followed in 1973.

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[15] A more appropriate term would probably be a "data swamp for surfers." With some exceptions, what on-line services, the Internet, and the World Wide Web are doing at present is inundating the consumer with lots and lots of data. And it is a stretch to go from screens and screens of data to useful information, not to mention knowledge or wisdom.

[16] See Dhebar (1995a) for a selective look at Reuters' technology, product, and business history.

- In 1981, Reuters introduced a Monitor Dealing Service, a major step forward in the information value chain: the service allowed subscribers to follow up the Monitor Money Rates Service information with deals for buying and selling foreign exchange.
- By the late 1980s, as personal computers and powerful workstations began dotting the financial community's desks throughout the world, the company spread out in the financial product space, providing worldwide subscribers not only (real-time and historical) price and related information about a broad range of financial securities from major world markets, but also general news, still pictures, television footage, analytical and position-keeping software, and the ability to conduct matched or conversational trades. All with the help of automatic input datafeeds and manual data contributions; computerized database management, editing, and publishing; multimode (wire, wireless, cable, telephone, satellite, and so on) telecommunications and networking; and proprietary- and open-system terminal electronic display—and without permanent recording on a physical medium.

The Reuters story provides valuable conceptual hooks for structuring our IT-and-product-policy discussion, beginning with three models of electronic-information distribution:[17]

(1) One-way, point-to-mass broadcasting: the same information (or data, depending on where significant value is added) is broadcast from a central point to a geographically dispersed population of consumers, without the possibility of consumers interacting with the supplier or each other over the same broadcast network. While the same information is broadcast to everyone, consumer-site hardware or software filters may allow restricted or selective information access (premium cable channels are a good example).

[17] The following classification is motivated by product-policy focus of this article. The schema is highly stylized and is not meant to be—and should not be read as—a definitive treatment of networking and communications.

(2) Networked information dissemination with one-to-many two-way communication linkages: in this model, the information supplier can selectively distribute information, and the consumer can use the same communication channel remotely to query and analyze the supplier's database, "talk back" to the supplier, transact with or route a transaction via the supplier, and so on.

(3) Networked information dissemination with many-to-many two-way communication linkages: this model offers similar capabilities as the second model—and, in addition, the possibility of intelligent inter-consumer linkages (for data and information transfer, database query, remote computing, transactions, and so on).

The first model allows the broadcasting of information; the second model allows directed, selected distribution of information and supplier-customer interactivity; and the third model allows directed, selective distribution of information and networked interactivity. What the information supplier does with the different models in terms of product offerings is up to the supplier, the technology (both information and telecommunications), regulations, and custom.

In theory, all three models allow the information supplier to

- bypass traditional information-product distributors and intermediaries and establish direct linkages with information consumers—and deliver information at a place and in a form most convenient to the consumer;
- reach a much larger population of geographically dispersed consumers—and at a very low marginal cost (indeed, in the broadcasting model, the marginal cost of reaching one more consumer is zero);
- transform the "pot" representing the information into which the "clay" of information is turned at the "potter's wheel" of the information supplier from a physical medium into a transient flicker on an electronic (video or audio) screen (and physical exchange of information products into an electronic transfer over wired and wireless telecommunication links);

- depending on the context, deliver information in "real time" rather than in the form of periodic dispatches; and
- deliver the information promptly (literally in seconds rather than minutes and hours) and at the same time (irrespective of whether the consumer is in Brasilia, New York, or Ulan Bator);

The transformations in distribution system, market reach, product medium, core and augmented product, and value proposition cannot but have significant implications for product policy. It must be "back to the drawing board" for product managers; a question not just of retrofitting but starting with a clean slate.

If such a thing is possible, the clean slate should be even cleaner in the case of the second model, which allows for selective information distribution and two-way supplier-consumer interaction. The consumer's ability to query and analyze databases remotely requires a major rethink of the information product, the supplier's ability to distribute information selectively has major implications for the product line (which can now have much greater product variety and, possibly, different levels of value added to raw data), and two-way interactive capability offers the possibility of expanding the product scope to include not include data and information, but also analysis and transactions.

The third model pushes the product-offering envelope even further, allowing as it does transactions among any two parties connected to the network and with the necessary transaction-access rights. Required of the product manager: a very, very clean slate—in terms of product vision, strategy, and policy.

In summary, electronic media and telecommunication network-based information-product distribution have three levels of implications for product policy:

(1) product change: possibly different slices through the data; a more mass product (broadcasting) or a more customized or customizable product (selective distribution);

and shift—from the consumer to the supplier or from the supplier to consumer—of value added and the mix between information and data-plus-analytical capabilities;

(2) product-line change: less (broadcasting) or more product variety (selective distribution); and

(3) product-scope change: to include analysis, contextual information, and transactional capability (between supplier and consumer and among consumers, directly or routed through the supplier).

Making the necessary changes in product strategy and policy, difficult enough for the traditional information supplier, is a particular challenge for suppliers of products other than information who suddenly discover opportunities to (1) augment their core product, (2) expand the product scope to also include information, and (3) use the information network to conduct or to allow consumers to conduct transactions. What ought to be the "new" product offering? How does it link into the existing product offering? How should it be positioned? How should it be priced (if at all)?

The questions, while difficult, do not seem to deter the many automobile manufacturers, financial institutions, packaged-goods companies, physical-product distributors, transportation-service providers, other commercial organizations, educational and not-for-profit organizations, political parties, individuals, and so on, who are rushing to establish a presence on the Internet. The phenomenon is particularly interesting because, unlike traditional information providers, these newcomers to the information business do not necessarily have the requisite experience base, business systems, or the decision-making processes to craft an effective product policy.

Of course, the flip side of the no-experience-and-therefore-difficult coin is free-of-preconceived-notions-and-therefore-open-to-new-ways-of-thinking: it may be easier for, say, a chemicals manufacturer to move aggressively into electronic on-line information distribution than, for example, a print-media publisher deeply rooted in the print-on-paper paradigm. The observation raises a question not so much about product policy as about managing change: how does the supply

chain in general and the information-product manager in particular embrace fundamental changes in paradigms, not willy-nilly but actively, intelligently, and wisely?

Concluding Comments

Increasingly, information products are electronically edited in editorial offices around the world, electronically transmitted to local offices, and electronically composed for distribution over a variety of media—hard copy, computer-readable discs, video tapes, public broadcasts, public and private electronic networks, and so on. The potter's wheel of IT furiously spinning products out of highly pliable digital data.

Not to be outdone, consumers have acquired potter's wheels of their own. Newly endowed with multimedia computers, data-analysis software, and information-management software tools, they are no longer content to let the information supplier to add most of the value—compose the story, compare the numbers, draw the graph, lay out the page, or package the book. Increasingly, consumers are demanding more direct access to original data, greater control over value added, more flexible data-navigation rights, and increased interactivity—all via a proliferating choice of media.

A revolution of sorts is under way—and it is not limited to only the traditional suppliers of information products. Helped in no small way by IT, suppliers of non-information products are discovering new product opportunities in information. Take commercial aviation. As the battles over computerized airline-reservation systems testifies, information about the timing, routing, and availability of airline flights has intrinsic economic worth over and beyond the value derived from the actual flying. Such information has become a product in its own right,[18] and it is directly impacted by IT.

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[18] To appreciate the potency of the transformation of product mix, consider the periodic assertion by the chairman of American Airlines, that if forced to choose between the airline and the company's computerized reservation system, he may jettison the airline (the reservation system yields a steady and sizable income stream, while the airline's fortunes tend to nose-dive at times of fare wars and slowdowns in air travel).

Similar product augmentation and product-scope expansion are evident in many other industries: there is the growing use of video terminals in supermarkets, department stores, automobile dealerships, tourist bureaus, and the like; physical-product manufacturers are sending consumers CD-ROMs and posting product information on the World Wide Web section of the Internet; and banks are going into on-line services. As these businesses go about determining appropriate strategies and tactics for these new products (or augmentations to their old products), the really intriguing question is, for example, will they be able to able to transform themselves into information providers? An interesting question, and one that transcends the discussion in this article.

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